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2014

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Marcin Wójcik

Technological University Dublin, marcin.wojcik@tudublin.ie

Sylwia Kłaczyńska

West Pomeranian University of Technology

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Recommended Citation

Wójcik, M. & Kłaczyńska, S. 2014). Continuing the 'Continua' I. Application of thin plywood in construction through biologically inspired approach. In Gu. N. et al (eds). *Rethinking Comprehensive Design: Speculative Counterculture. Proceedings of the 19th International Conference on Computer-Aided Design Research in Asia (CAADRIA 2014)*. Kyoto: The Association for Computer-Aided Architectural Design Research in Asia &(CAADRIA), Hong Kong.

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CONTINUING THE ‘CONTINUA’ I

Application of thin plywood in construction through biologically inspired approach

MARCIN WÓJCIK,¹ SYLWIA KŁACZYŃSKA,²

¹ *The Oslo School of Architecture and Design AHO, Oslo, Norway*
marcin.wojcik@aho.no

² *West Pomeranian University of Technology ZUT, Szczecin, Poland*
sklaczynska@zut.edu.pl

1. Introduction

This paper investigates a possibility of application of thin (ca. 5 mm) plywood as structural material. It takes departure from the Erwin Hauer’s ‘Continua’ series (Figure 1), and proposes how it could be developed with the contemporary digital tools and by following the biological paradigm. The objective is to develop a new system that minimises wastage as well as to test how the resulting structure performance.

2. Biological paradigm

The re-design of the ‘Continua’ series takes inspiration from the biomimetic approach. Biological systems utilise information rather than energy in order to solve technical problems and to self-assemble structures that unlike the engineered solutions are hierarchical. Energy is used sparingly, single material often serves both structural and protective purposes, the distinction between material and structure is blurred (Vincent et al., 2006). Today’s environmental concerns invoke interest in the efficient and rational biological systems.

3. ‘Continua’ worth continuing

Erwin Hauer (b.1926) is an Austrian-American sculptor, known for repetitive screen-wall systems based on modular elements cast in concrete, gypsum or acrylic resin or later CNC-milled in MDF and limestone (Hauer,

2004). These methods are time and energy consuming and produce waste. Our previous research indicates that 'Design 3' (1952) from the 'Continua' series would be applicable for external light-breaking building envelopes due to its light diffusing, wind and sound breaking capabilities.

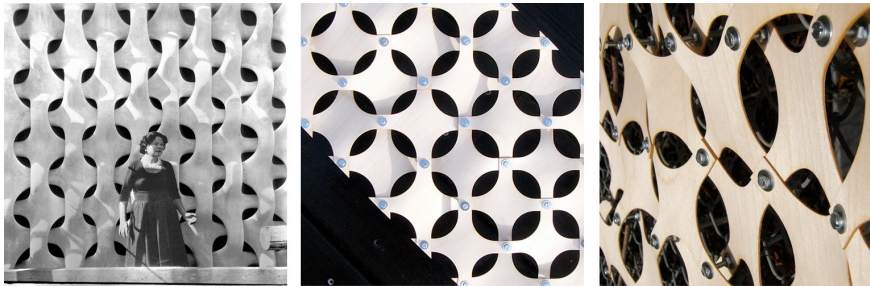


Figure 1 - Erwin Hauer's 'Design 3'. Figure 2 and 3 - proposed solution.

4. Proposed approach

The proposed solution (Figure 2) is based on thin plywood bent to form and thus achieving strength. Elastic bending is induced with threaded rods with nuts (Figure 3). By doing so much less material and time are used to produce a final piece. This solution required reconfiguration of the modules, but the geometrical features of the original are sustained. Thin plywood is light-weight, durable, flexible and based on a renewable resource. CNC laser cutter enables variation without extra production time, allowing for changing the geometry in response to the environmental factors. Hierarchically, global form is controlled locally at a level of a single unit, that being dependent on the material properties. The proposed system uses the method of parametric design, where the local geometry is variable within the modular framework.

5. Further development

It is proposed to develop the system further, especially to provide for self-support through the overall geometry, e.g. shells. Another path of development includes adding material criteria as the elastic bending parameter.

References

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